DIABETES, BLOOD PRESSURE AND HEART DISEASE PREDICTION AND DIAGNOSIS USING WEB APPLICATION

A PROJECT REPORT

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BONAFIDE CERTIFICATE

Certified that this project report " **DIABETES, BLOOD PRESSURE AND HEART DISEASE PREDICTION AND DIAGNOSIS USING WEB APPLICATION** "is the bonafide work of "**SHRUTHI R (310819104081),PITCHMA PRIYA K(310819104706) ,GIRISHA M V (310819104713)** " who carried out the project work under my supervision.

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The reports of the project work submitted by the above students in partial fulfillment for the award of Bachelor of Engineering Degree in Computer Science and Engineering of Anna University, Chennai were evaluated and confirmed to be reports of the work by the above students and then evaluated.

Submitted for viva-voce held on……..

INTERNAL EXAMINER **EXTERNAL EXAMINER**

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சுருக்கம்

மருத்துவத் துறையில், நோய்களை முன்கூட்டியே கண்டறிந்து அவற்றைத் தடுப்பது அவசியம், இரத்த அழுத்தம், நீரிழிவு மற்றும் இதய நோய் ஆகியவை வளர்சிதை மாற்றத்தின் குறைபாடு காரணமாக எழும் சில தீவிர நிலைமைகள், இது அனைத்து வயதினரிடையேயும் ஒட்டுமொத்த மக்களை பாதிக்கிறது. மரபியல் அல்லது முறையற்ற வாழ்க்கை முறைகள் இந்த மேற்கூறிய நிலைமைகளை உருவாக்குகின்றன நீரிழிவு, பிபி மற்றும் இதய நோய் 1 என்பது உலகம் முழுவதும் உள்ள பெரும்பாலான நோய்களில் ஒன்றாகும். நவீன வாழ்க்கை முறைகளில், சர்க்கரை மற்றும் கொழுப்பு பொதுவாக நமது உணவுப் பழக்கங்களில் உள்ளன, இது நீரிழிவு, பிபி மற்றும் கொலஸ்ட்ரால் அபாயத்தை அதிகரித்துள்ளது. இந்த நோயைக் கணிக்க மற்றும் கண்டறிய, இயந்திர கற்றல் (ML) வழிமுறைகள் நோயைக் கண்டறிவதற்கு மதிப்புமிக்கவை. நீரிழிவு நோய் கண்டறிதல் நேர்மறையா எதிர்மறையா என்பதைத் தீர்மானிக்க தரவுத்தொகுப்பை இது பகுப்பாய்வு செய்கிறது. இந்த ஆராய்ச்சியில் பயன்படுத்தப்படும் தரவுத்தொகுப்பு முறையே 70:30 என்ற விகிதத்தில் பயிற்சி தரவு மற்றும் சோதனை தரவு என பிரிக்கப்பட்டுள்ளது. இந்த மாதிரிகளின் வெளியீடு தெளிவற்ற மாதிரிக்கான உள்ளீட்டு உறுப்பினர் செயல்பாடாக மாறுகிறது, அதேசமயம் தெளிவற்ற தர்க்கம் இறுதியாக நீரிழிவு நோய் கண்டறிதல் நேர்மறையா எதிர்மறையா என்பதை தீர்மானிக்கிறது. ஒரு

கிளவுட் ஸ்டோரேஜ் சிஸ்டம் எதிர்கால பயன்பாட்டிற்காக இணைந்த மாதிரிகளை சேமிக்கிறது. நோயாளியின் நிகழ்நேர மருத்துவப் பதிவின் அடிப்படையில், நோயாளி நீரிழிவு நோயாளியா இல்லையா என்பதை இணைத்த மாதிரி கணிக்கும். முன்மொழியப்பட்ட இணைக்கப்பட்ட ML மாதிரி துல்லியமான முடிவுகளைக் கணிக்கும்.

ABSTRACT

In the medical field, it is essential to predict and diagnosis diseases to prevent them early,Blood pressure, Diabetes and Heart Disease are few of the serious conditions arising due to metabolism inadequacy, affecting the overall population among people of all age groups. Genetics or improper lifestyles construct these above conditions Diabetes,bp and heart disease l is one of the mostly diseases all over the world. In modern lifestyles, sugar and fat are typically present in our dietary habits, which have increased the risk of diabetes,bp and cholesterol. To predict and diagnosis these disease ,machine-learning (ML) algorithms are valuable for disease detection. This analyze the dataset to determine whether a diabetes diagnosis is positive or negative. The dataset used in this research is divided into training data and testing data with a ratio of 70:30 respectively. The output of these models becomes the input membership function for the fuzzy model, whereas the fuzzy logic finally determines whether a diabetes diagnosis is positive or negative. A cloud storage system stores the fused models for future use. Based on the patient's real-time medical record, the fused model predicts whether the patient is diabetic or not. The proposed fused ML model will be predicting accurate results.

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1. INTRODUCTION

Diabetes, high blood pressure, and heart diseases are among the most common diseases that affect millions of people worldwide. These diseases are not only costly to manage, but they also have severe long-term consequences on an individual's health and well-being. Early detection of these diseases is crucial for the successful management and prevention of complications.

Machine learning has shown great potential in predicting and diagnosing various diseases. In this project, we aim to develop a web application that predicts the risk of diabetes, high blood pressure, and heart disease using machine learning algorithms. The application will provide users with an easy-to-use interface to input their health data and receive a prediction of their disease risk.

1.1 SCOPE OF PROJECT:

The predictive system of diabetes, blood pressure, and heart disease are been introduced in theory and practical experiments. Have been carried out for the past years through technological advancements. Though the accuracy has been elevating in prediction and following precision manner. The model consists of both prediction and diagnosis modules, which can further implemented in the diagnosis. Where it can provide a precise, user friendly, non allergic medications such as Ayurvedic, Homeopathy ..etc along with the medical field enhancements developing side by side. First to introduce the diagnosis section.

1.2 PROJECT OBJECTIVE :

The application will provide users with an intuitive interface to input their health data, such as age, gender, body mass index (BMI), blood pressure, fasting glucose, and overall health data profile. The machine learning models used in the application will be trained on a large data set of health records and will use a variety of features to predict the risk of each disease. The application will provide users with a clear and easy-to-understand prediction of their disease risk and will also provide recommendations for lifestyle changes that may help reduce their risk. The application will be tested on a sample populations to validate its accuracy and effectiveness in predicting disease risk.

2.LITERATURE SURVEY

S.No	TOPIC	CONTENT	AUTHOR	YEAR
1.	Implementation of Diabetic Retinopathy Prediction System using Data Mining	Blindness due to Diabetic Retinopathy (DR), this survey is based on proper eye inspection and early detection using Data Mining techniques. Major application on Neural Network and naive Bayes of classification.	Siddharekh S. Patil, Kalpana Malpe.	2019
2.	Diabetic Patient Prediction using Machine Learning Algorithm	Database construction of Diabetic Mellitus affected patients using machine learning techniques,algorithms and Statistical approach for early prediction of old and new datasets. For experimental analysis, Logistic Regression, Tree Classifier and Gradient Boosting used according to diagnostic measurements. Applied algorithm for comparison and accuracy	Malini M, Gopalakrishna B, Dhivya K; Naveena S	2021

3.	Disease Influence Measure Based Diabetic Prediction with Medical Data Set Using Data Mining	The problem of diabetic prediction has been well studied in this paper. The disease predictions have been explored using various methods of data mining. The use of medical data set on the prediction of diabetic mellitus has been proven.	B.V.Baiju, D.John Aravindhar.	2019
4.	Analysis of Various Techniques and Methods for the Prediction of Diabetic Eye Disease in Type 2 Diabetes	Our proposed work is inclined towards prediction of the eye diseases by analyzing the electronic health records of the diabetic patients. The objective of this study is to analyze various techniques and methods that are applicable for	Pawandeep Sharma, Anand Kumar Shukla	2021
5.	Classification of hypertension using an improved unsupervised learning technique and image processing	Chapter presents an improved nearest neighbor distance clustering algorithm by recognizing the lesions present in the retina. The current approach identifies the symptoms associated with retinopathy for hypertension and classifies the hypertensive retinopathy.	Usharani Bhimavarapu, Mata Mittal.	2022

6.	Experimented on PIMA Indian Diabetes (PID) data set.	It has 768 instances and 8 attributes and is available in the UCI machine learning repository. They aimed to focus more on diabetes diagnosis, which, according to the World Health Organization (WHO) in 2014, is one of the world's fastest-growing chronic diseases. Gradient boosting, logistic regression, and naive Bayes classifiers were used to predict whether a person is diabetic or not, with gradient boosting having an accuracy of 86%, logistic regression having a 79% accuracy, and naive Bayes having a 77% accuracy.	Birjais.	2019
7.	An Intelligent Learning System based on Random Search Algorithm and Optimized Random Forest Model for Improved Heart Disease Detection	This paper uses random search algorithm (RSA) for factor selection and random forest model for diagnosing the cardiovascular disease. This model is principally optimized for using grid search algorithmic	Ashir Javeed, Shijie Zhou.	2017

		program.		
8.	Effective Heart Disease Prediction Using Hybrid Machine Learning Techniques	efficient technique using hybrid machine learning methodology. The hybrid approach is combination of random forest and linear method. The dataset and subsets of attributes were collected for prediction. The subset of some attributes were chosen From the pre-processed knowledge(data) set of cardiovascular disease .After prep-processing , the hybrid techniques were applied and disgnosis the cardiovascular disease	Senthilkumar Mohan, Chandrasegar Thirumalai.	2019

9.	Prediction and Diagnosis of Heart Disease Patients using Data Mining Technique	This paper uses techniques of Artificial Neural Network, KNN, Random Forest and SVM. Comparing with the above mentioned classification techniques in data mining to predict the higher Accuracy for diagnosing the heart disease is ANN	Mamatha Alex P, Shaicy Shaji P.	2019
10.	Prediction of Blood Pressure variability using Deep Neural Networks	purpose of our study was to predict blood pressure variability from time-series data of blood pressure measured at home and data obtained through medical examination at a hospital. Previous studies have reported the blood pressure variability is a significant independent risk factor for cardiovascular	Hiroshi Koshimizu, Ryosuke Kojima, Kazuomi Kario, Yasushi Okuno.	2020

3. SYSTEM ANALYSIS

3.1 EXISTING SYSTEM :

The existing system is an android application that gets input and predicts diabetes is there or not.It contains only one module 1. Diabetics

3.2 DISADVANTAGES :

1. Application requires installation, leading to unnecessary reduction of data storage.
2. Complexity of systems and measurements.(Non user friendly for Elderly or children)
3. May involves cost of application.
4. Constant system reload due to the complexity of the applications.
5. Default in proper diagnosis

3.3 PROPOSED SYSTEM :

The Proposed system is a Web application not only predicts Diabetes but also predicts and diagnosis blood pressure and Heart Disease .And this system works under three modules ,1. Diabetes 2. Blood pressure and 3. Heart Disease.

3.4 ADVANTAGES :

1. The website has more convenience in usage.
2. Websites don't need large data intake compared with applications.
3. Availability in platforms such as Google Chrome etc, which are preinstalled application features of an android

4. Simple knowledge of weight and other requirements of inputs are necessary.

5. Provides Accurate medicines towards diagnosis.

6. To avoid wrong diagnosis of high level BP, Diabetes and Cholesterol, a simple notification of Alert message is used for consultation of a doctor.

7. Focuses mainly on comfort,stress reduction and reduce panic attack of the diagnosed patient.

4. SYSTEM CONFIGURATION

4.1 HARDWARE :

Processor : 64-bit, four-core, 2.5 GHz minimum per core

RAM : 8 GB for developer and evaluation use

4.1.1 HARDWARE DESCRIPTION :

Processor : 64-bit, four-core, 2.5 GHz minimum per core

- A 64-bit, four-core processor with a minimum clock speed of 2.5 GHz per core is a powerful processor that can handle demanding tasks such as gaming, video editing, and running virtual machines.

- 64-bit processors are capable of addressing larger amounts of memory than 32-bit processors, which makes them ideal for running applications that require large amounts of memory.

- Having four cores means that the processor can handle four separate tasks simultaneously, which can result in faster and more efficient processing of tasks.

- A minimum clock speed of 2.5 GHz per core indicates that the processor is fast and can handle tasks quickly. However, it's important to note that other factors such as cache size, memory bandwidth, and the efficiency of the underlying architecture also play a role in determining the overall performance of the processor.

RAM : 8 GB for developer and evaluation use

- 8 GB of RAM should be sufficient for developing a project that predicts and diagnoses diabetes, high blood pressure, and heart disease. However, the actual amount of memory required depends on the specific tools and algorithms used in the project.

- Developing predictive models and diagnosing diseases requires a lot of data processing and analysis, which can be memory-intensive. Therefore, if you plan to work with large datasets or complex algorithms, you may want to consider increasing the amount of RAM to improve performance and reduce processing time.

- Additionally, it's important to ensure that your computer meets the minimum system requirements for the software and tools you plan to use in your project, as they may have specific hardware and memory requirements.

4.2 SOFTWARE :

- Operating System : Window 64 bit
- Database server : CSV File
- Front End : Python
- Back End : Python

5. SYSTEM DESIGN

5.1 ARCHITECTURE DESIGN

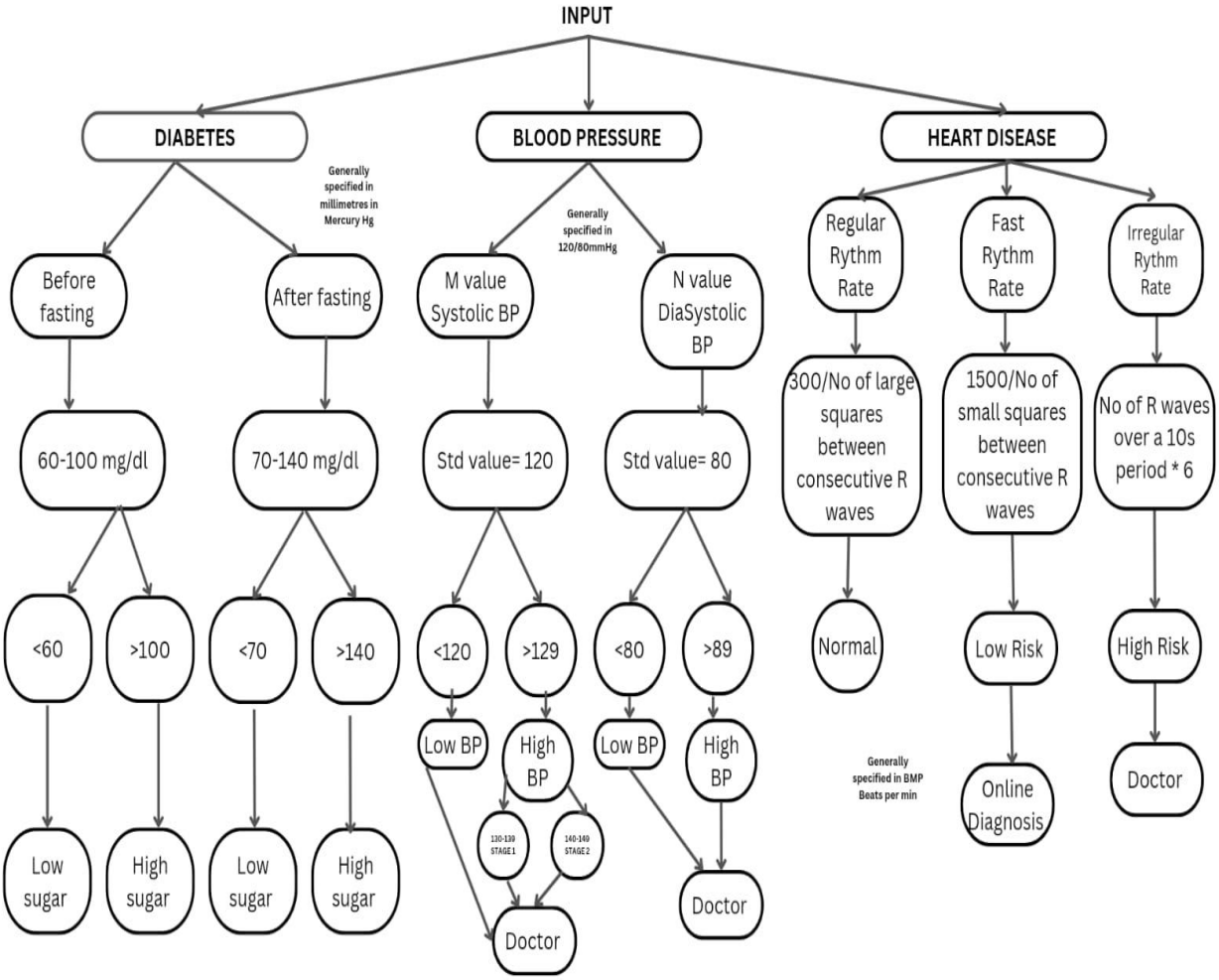


Figure 5.1 Architecture System

5.2 DATA FLOW DIAGRAM

LEVEL 0 :

Figure 5.2.1 Input Diagram

LEVEL 1 :

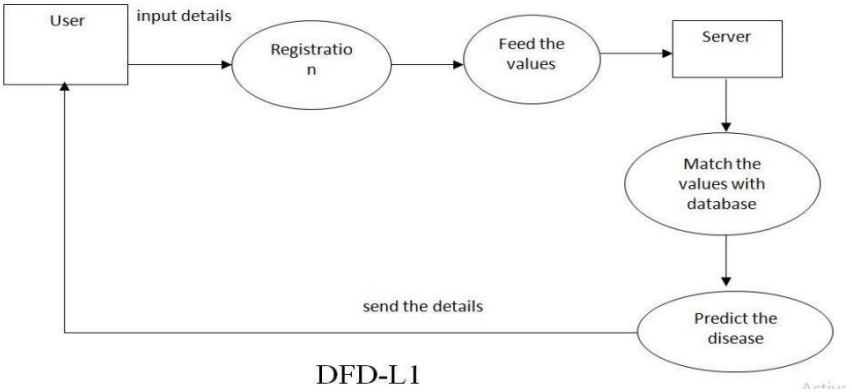


Figure 5.2.2 Database Storage Diagram

LEVEL 2:

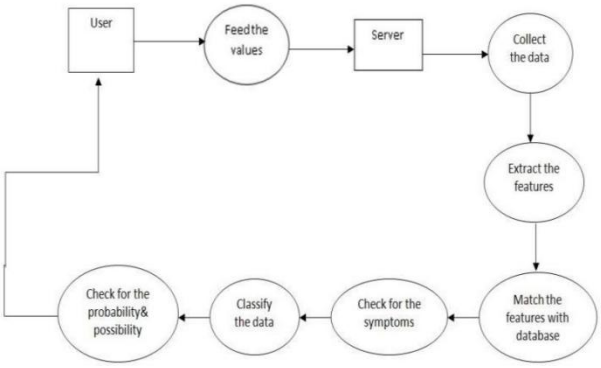


Figure 5.2.3 Entire Process

5.3 UML DIAGRAMS

5.3.1 USE CASE DIAGRAM :

Figure 5.3.1.1 Use Case Diagram

5.3.2ACTIVITY DIAGRAM:

5.3.2.1 DIABETES MODEL :

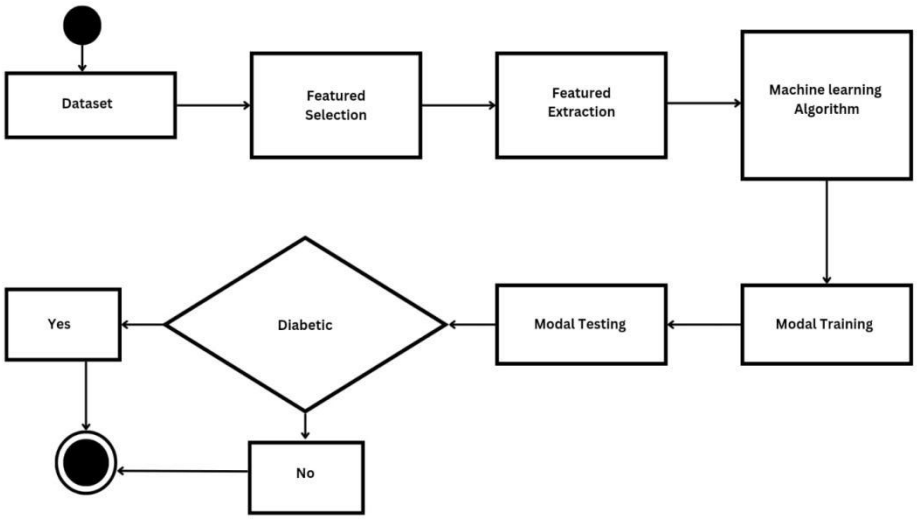


Figure 5.3.2.1 Diabetes Workflow

5.3.2.3 BLOOD PRESSURE MODEL :

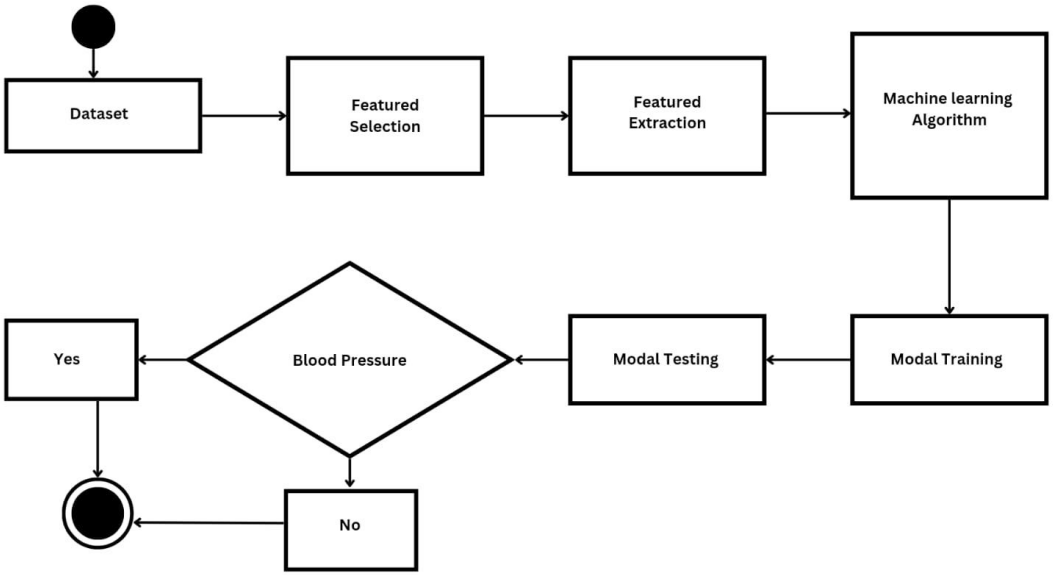


Figure 5.3.2.3 Blood Pressure Workflow

5.3.2.2 HEART DISEASE MODEL:

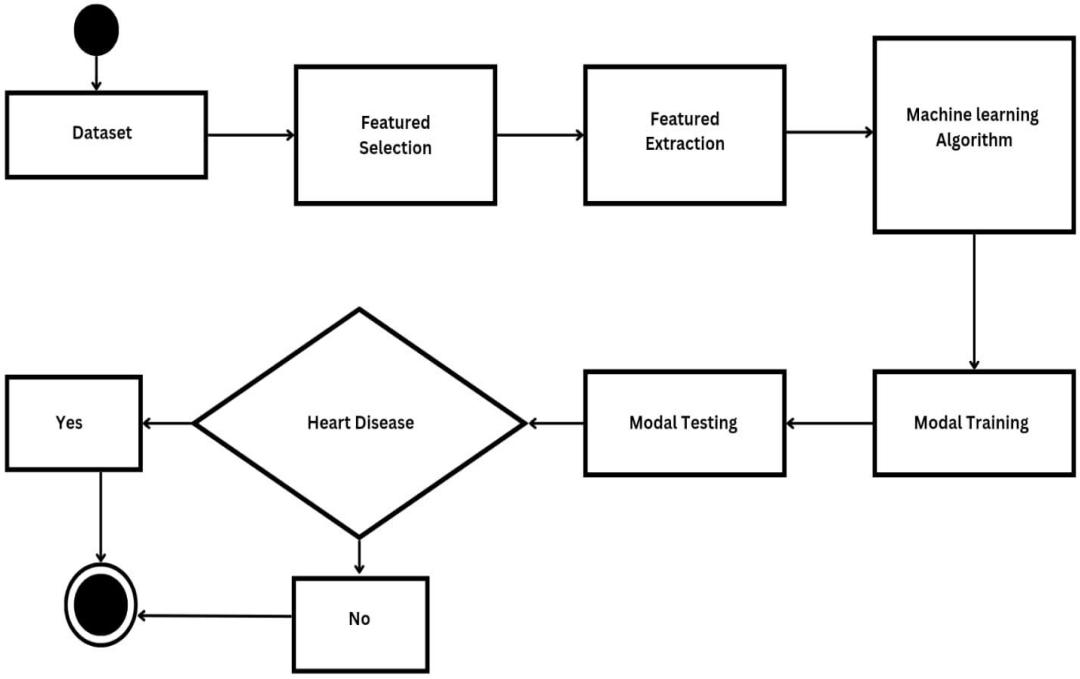


Figure 5.3.2.3 Heart Disease Workflow

5.3.3 SEQUENCE DIAGRAM :

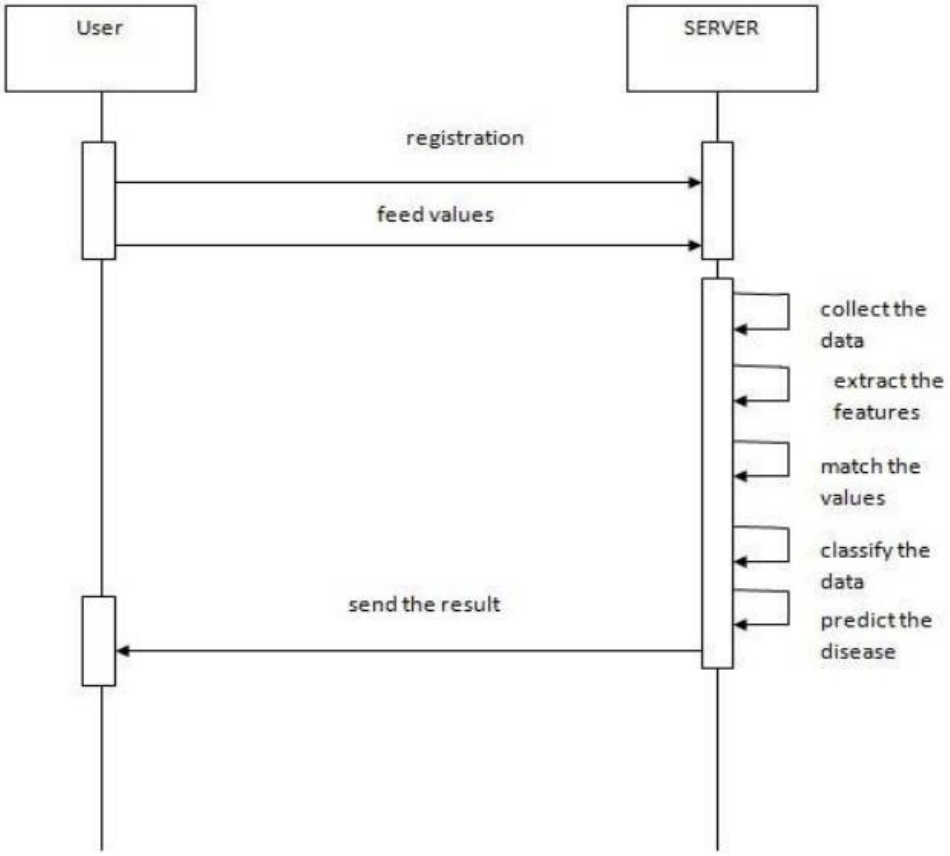


Figure 5.3.3 Sequence Diagram

5.4 OVERALL DIAGRAM

5.4.1 PREDICTIVE SYSTEM:

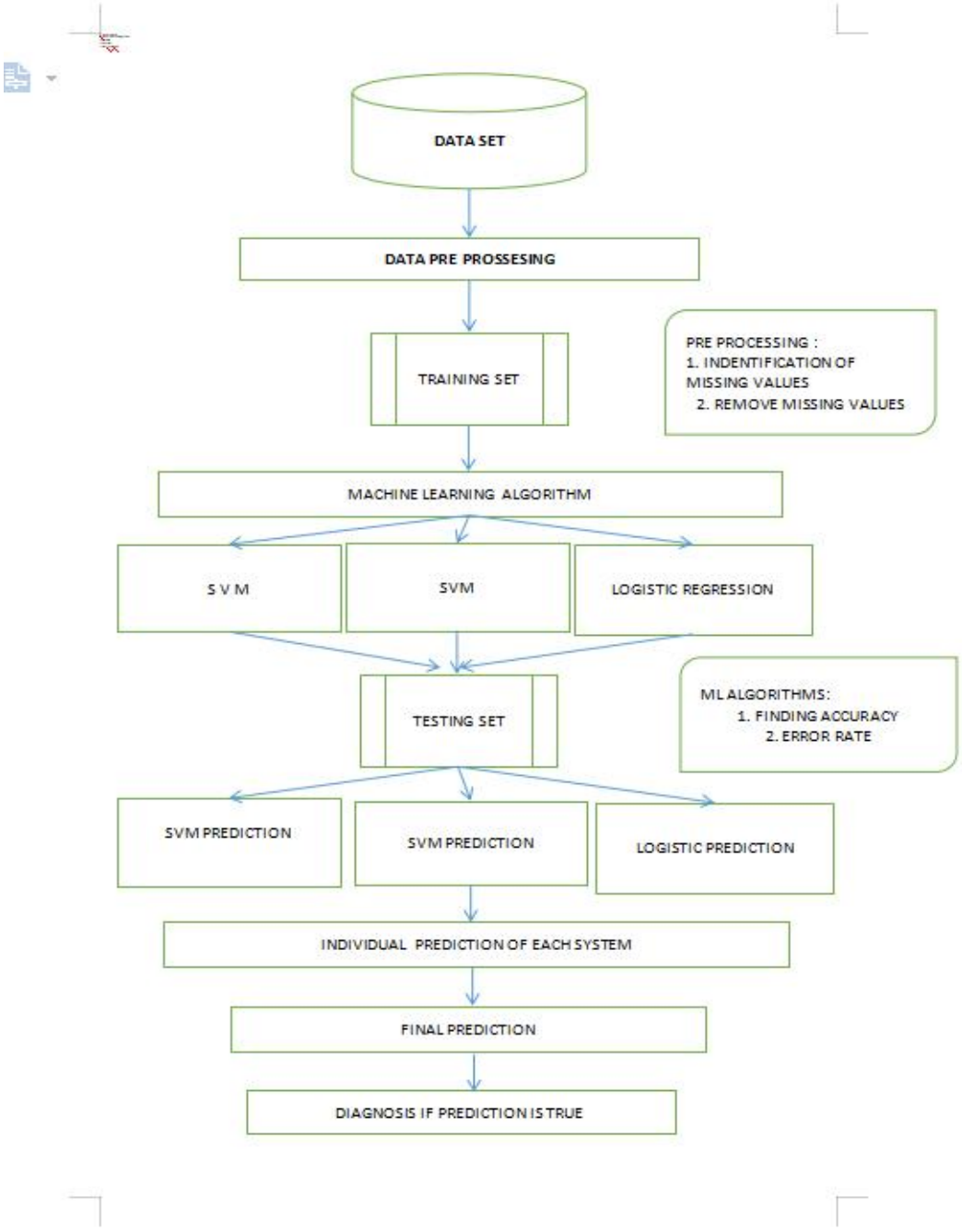


Figure 5.4.1 Predicitive System

5.4.2DIAGNOSIS SYSTEM

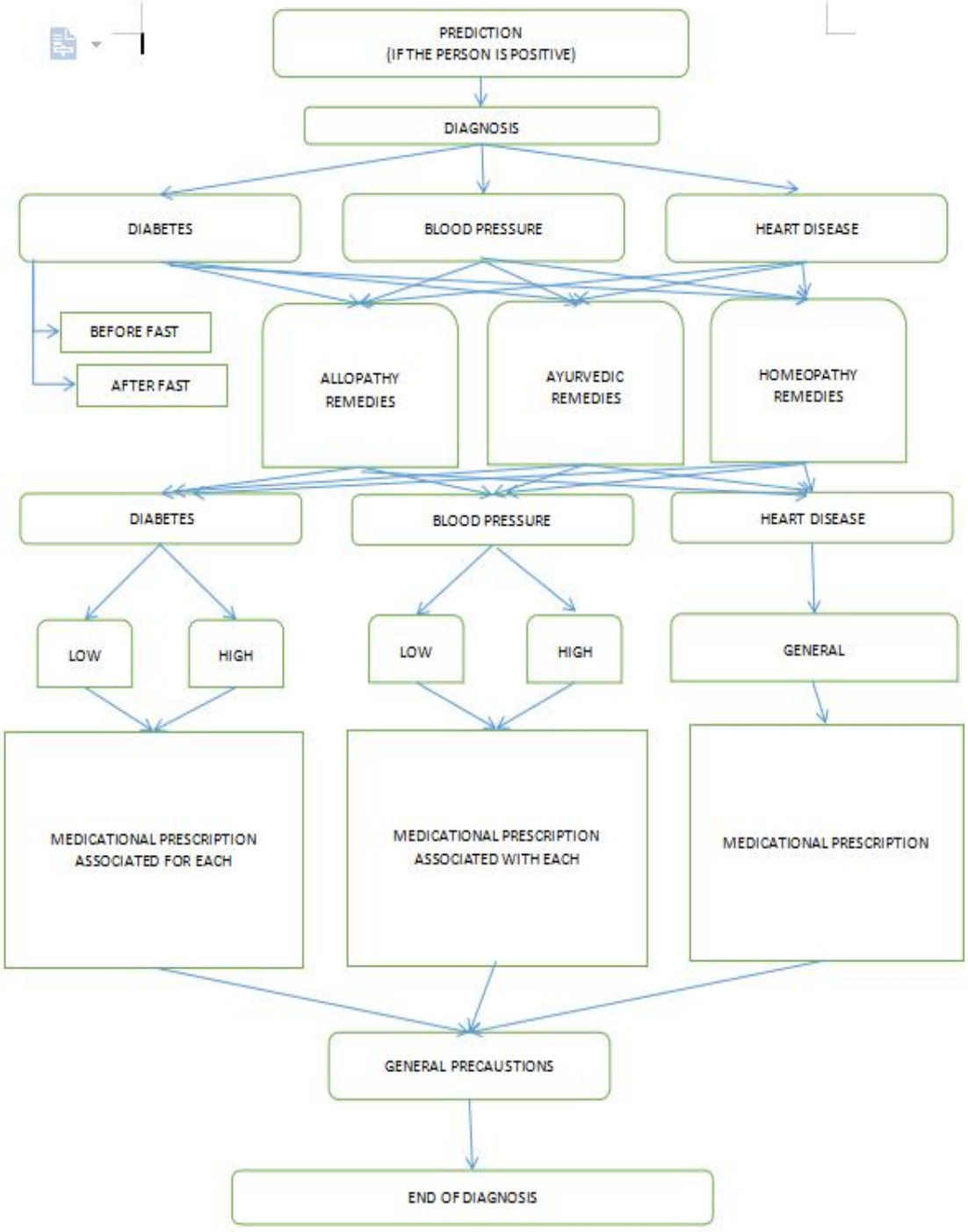


Figure 5.4.2 Diagnosis System

6. SYSTEM ANALYSIS

This project aims to develop a web application that leverages machine learning to predict the risk of diabetes, high blood pressure, and heart disease. The application will provide users with an easy-to-use interface to input their health data and receive a prediction of their disease risk, enabling early detection and prevention of
these chronic diseases.

The project aims to develop a web application that predicts the risk of three common diabetes, high blood pressure, and heart disease. The application will use machine learning algorithms to analyze health data provided by the user, such as age, gender, body mass index (BMI), blood pressure, fasting glucose, and lipid profile. Based on these inputs, the application will predict the likelihood of the user developing one or more of these chronic diseases.

To achieve this goal, the project will involve several stages. First, we will gather a large data set of health records that includes information on patients' demographics, medical history,and laboratory test results. This data set will be used to train machine learning models that can predict the risk of diabetes, high blood pressure, and heart disease based on a variety of features. Next, we will develop a web application that provides users with an easy-to-use interface to input their health data and receive a prediction of their disease risk. The application will use the trained machine learning models to analyze the user's data and provide a clear and easy-to-understand prediction of their risk. The application will also provide users with recommendations.

7. MODULES

Our project further classified into two categories :

- ❖ Prediction
- ❖ Diagnosis

Both categories consists of three modules :

- ✧ Diabetes
- ✧ Blood Pressure
- ✧ Heart Disease

7.1 PREDICTION :

7.1.1 DIABETES MODULE :

Diabetes can be predicted and diagnosed by getting the input from the user.In this module the system gets the insulin level for both before and after diet readings from the user and produce output by predicting and Diagnosing remedies.The Process starts by the following ,In Fasting, plasma glucose level should be between 60 to 100 system for a normal person returns "Healthy "If it is lesser than 60 it returns "Low Sugar " and if it is higher it returns "High Sugar"and for after Post meal level should be between 70 to 140 system for a normal person returns "Healthy "If it is lesser than 70 it returns "Low Sugar " and if it is higher it returns "High Sugar".If the person is having between 140 -150mg/dl the system prescribe for online diagnosis.If the levels are beyond 150 the system prescribe to consult doctors.

7.1.2 BLOOD PRESSURE MODULE :

In this module,Input is entered in the form of 2 values as M and N. M- Systolic Blood Pressure N- Diastolic Blood Pressure.The system runs a comparative analysis of M value with standard blood pressure value of 120 and N value with standard pressure of exertion while heart beat resting of 80.If the value of inputs are less than 120/80, then it is detected as Low blood pressure.Diagnosis is provided with simple diet alternatives, exercises or Alert message (in case of lower) of Consultation of a doctor.If the value of inputs are more than 120/80, then it is detected as high blood pressure/ hypertension.further categorized as Stage 1(130-139/80-89 mm Hg) and Stage 2(140/90 and higher mm Hg) and diagnosis is done Diagnosis is provided with simple diet alternatives, exercises (in case of lesser or initial of Stage 1)or Alert messages of Consultation of a doctor.

7.1.3 HEART DISEASE MODULE :

Heart disease describes a range of conditions that affect the heart. Heart diseases include:Blood vessel disease, such as coronary artery disease Irregular heartbeats (arrhythmia), Heart problems you're born with (congenital heart defects,) Disease of the heart muscle,Heart valve disease and many other forms of heart disease can be prevented or treated with healthy lifestyle choices. There are many other conclusions and predictive systems, the module surely describes the overview of each component which are used in the prediction and diagnosing parts

7.2 DIAGNOSIS :

7.2.1 DIABETES MODULE :

Diagnosis processes is been produced, when the outcome is shown as “person is diabetic”. It is further differentiated between low and high sugar levels. Low sugar levels constituted of less than 60 mg/dl before fasting and less than 70 mg/dl. Higher sugar levels constituted of greater than 100 mg/dl before fasting and greater than 140 mg/dl. The medications have been prescribed and customized on basis of allopathy, ayurvedic and homeopathy for the user’s convenience. Users selection on Allopathic section are been prescribed with Diazoxide, Octreotide, Dextrose, Glucogen for low sugars and DPP-4 inhibitors, Sulfonylureas,etc for high sugars. For selection on Ayurvedic section , Amla, Cinnamon, Fenugreek, Bitter gourd as of low sugars and Tumeric, Bsil, Ginger as of high sugars are been prescribed. For selection on Homeopathy section , Nux Vomica, Oenothera biennis, Arsenicum as of low sugars and Phospherics as of high sugars are been prescribed

7.2.2 BLOOD PRESSURE MODULE :

Diagnosis processes is been produced, when the outcome is shown as “person has blood pressure”. The medications have been prescribed and customized on basis of allopathy, ayurvedic and homeopathy for the user’s convenience. Users selection on Allopathic section are been prescribed with fludocortisone for low BP and Captopril, Fasinopril, Acebutolol, Betaxolol, Kateriazia etc for high BP. For selection on Ayurvedic section , TriKtu, Makaradhwaja ras of low BP and Sarpgandha, Desi Ashwagandha, Arjun Chaal, Brahmi as of high BP are been prescribed. For selection on Homeopathy section , Gelsemium, Viscum Album as of low BP and Belladonna, Lachesis, Glonoinum as of high BP are been prescribed

7.2.3 HEART DISEASE MODULE :

Diagnosis processes is been produced, when the outcome is shown as “person has Heart Disease”. The medications have been prescribed and customized on basis of allopathy, ayurvedic and homeopathy for the user’s convenience. Users selection on Allopathic section are been prescribed with Statins, Beta-Blockers for low cholesterol and Aspirin, Clopidogrel, Warfarin, ACE inhibitors etc for maintaining heart beat. For selection on Ayurvedic section, Triphila, Ashwagandha, Chaywanprash of low cholesterol and Noni capsules, Nerve up tablets, Hrudroga Chitamani as of maintaining heart beat are been prescribed. For selection on Homeopathy section, Lactodectus, Aurum mettallicum as of low cholesterol and Digitalis, Spigelia etc for maintaining heart beat are been prescribed

8. ALGORITHMS

- **SUPPORT VECTOR MACHINE ALGORITHM**
- **LOGISTIC REGRESSION ALGORITHM**

8.1 SUPPPORT VECTOR MACHINE ALGORITHM :

Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning.

The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future. This best decision boundary is called a hyperplane.

8.2 LOGISTIC REGRESSION ALGORITHM :

- Logistic regression is one of the most popular Machine Learning algorithms, which comes under the Supervised Learning technique. It is used for predicting the categorical dependent variable using a given set of independent variables.
- Logistic regression predicts the output of a categorical dependent variable. Therefore the outcome must be a categorical or discrete value. It can be either Yes or No, 0 or 1, true or False, etc. but instead of giving the exact value as 0 and 1, **it gives the probabilistic values which lie between 0 and 1**

8.3 DIFFERENCES BETWEEN SUPPORT VECTOR MACHINE AND LOGISTIC REGRESSION ALGORITHM

SUPPORTVECTOR MACHINE ALGORITHM	LOGISTIC REEGRESSION ALGORITHM
● It is an algorithm used for solving classification problems.	● It is a model used for both classification and regression
● It is not used to find the best margin, instead, it can have different decision boundaries with different weights that are near the optimal point.	● it tries to find the “best” margin (distance between the line and the support vectors) that separates the classes and thus reduces the risk of error on the data.
● It works with already identified identified independent variable.	● It works well with unstructured and semi-structured data like text and images.
● It is based on statistical approach.	● It is based on geometrical properties of the data.
● It is vulnerable to overfitting.	● The risk of overfitting is less in SVM.

TABLE 8.3 DIFFERENCES

9. TECHNIQUES

9.1 BUILDING MODEL :

Numerous styles are used to perform data mining. Machine literacy is one of the approaches. Since bracket ways are used in this design, bracket is one of the data mining processes in this phase of categorical data bracket.And this step is divided into two phases training and testing. In the training phase, destined data and associated class markers are used for bracket. The training stage is frequently appertained to as supervised literacy. The medication and testing phases of the bracket process are depicted in the illustration. In the training process, training tuples are used, and in the test data phase, test data tuples are used, and the bracket rule's delicacy is calculated.

Assume that the bracket rule's delicacy on testing data is sufficient for the rule to be used for the bracket of unlined data. This emphasis is on the class imbalance problem and the need to handle this problem before applying any algorithm to achieve better delicacy rates. The class imbalance substantially occurs in a dataset having dichotomous values, which means that the class variable has two possible issues and can be handled fluently if observed before in the data reprocessing stage and will help in boosting the delicacy of the prophetic model.

To ensure the accuracy and effectiveness of the application, we will test it on a sample population and evaluate its performance in predicting disease risk. We will also collect user feedback to identify areas for improvement and make necessary adjustments to the application.

9.2 PROPOSED MODEL :

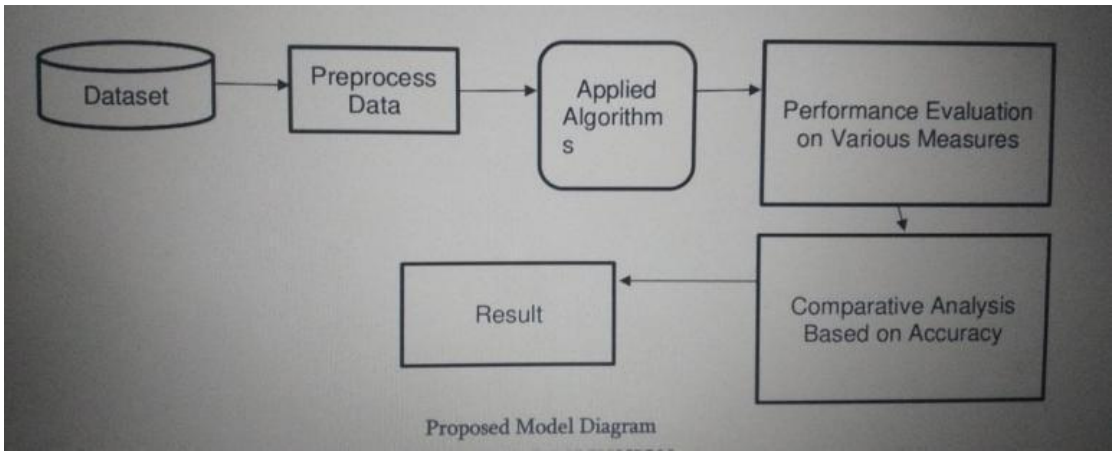


Figure 9.2 Proposed System

- **Data analysis**:

  Here one will get to know about how the data analysis part is done in a data science life cycle.

- **Exploratory data analysis**:

  EDA is one of the most important steps in the data science project life cycle and here one will need to know that how to make inferences from the visualizations and data analysis

- **Model building**:

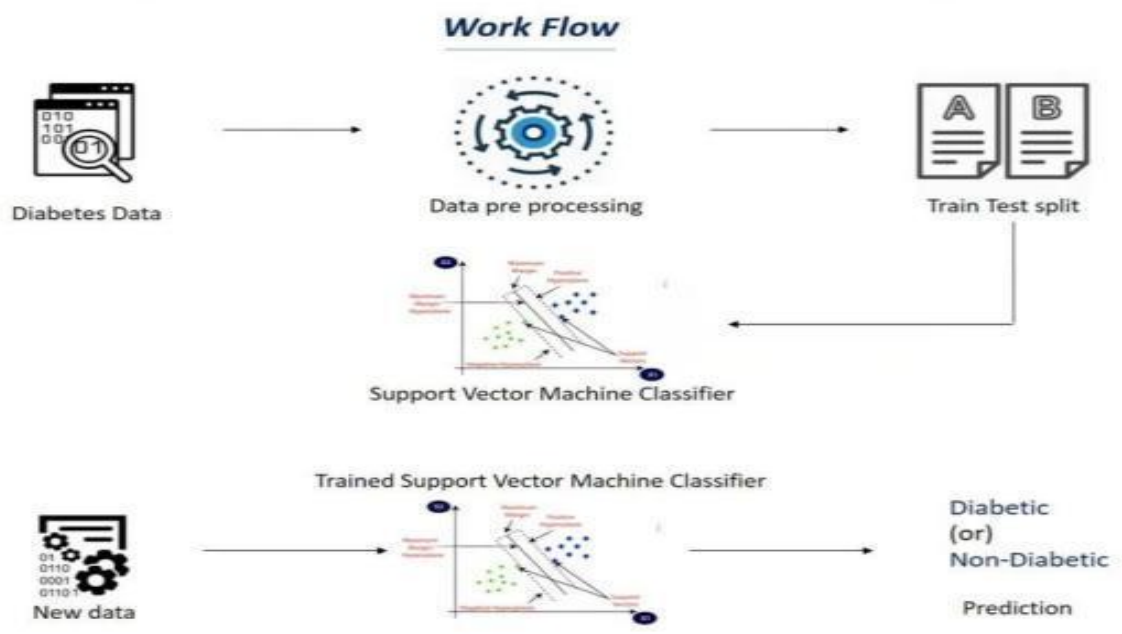
  Here we will be using 4 ML models and then we will choose the best performing model.

- **Saving model**:

  Saving the best model using pickle to make the prediction from real data.

10. SYSTEM WORKFLOW

10.1 DIABETES PREDICTION MODULE :



Diabetes is a chronic disease with the potential to cause a worldwide health care crisis. According to International Diabetes Federation 382 million people are living with diabetes across the whole world. By 2035, this will be doubles 592 million. Diabetes is a disease caused due to the increase level of blood glucose. This high blood glucose produces the symptoms of frequent urination,increased thirst, and increased hunger. Diabetes is a one of the leading cause of blindness, kidney failure, amputations, heart failure and stroke. When we eat,our body turns food into sugars, or glucose. At that point, our pancreas is supposed to release insulin. Insulin serves as a key to open our cells, to allow the glucose to enter and allow us to use the glucose for energy. But with diabetes, this system does not work. Type 1 and type 2 diabetes are the most-common forms of the disease, but there are also other kinds,

such as gestational diabetes, which occurs during pregnancy, as well as other forms. Machine learning is an emerging scientific field in data science dealing with the ways in-which machines learn from experience. The aim of this project is to develop a system which can perform early prediction of diabetes for a patient with higher accuracy by combining the results of different machine learning techniques. The algorithms like Support vector machine The accuracy of the model using each of the algorithms is calculated. Then the one with a good accuracy is taken as the model for predicting the diabetes.

10.1.1 DIABETES DESCRIPTION :

Diabetes is the fast growing disease among the people even among the youngsters.In understanding diabetes and how it develops, we need to understand what happens in the body without diabetes. Sugar (glucose) comes from the foods that we eat, specifically carbohydrate foods.Carbohydrate foods provide our body with its main energy source everybody, even those people with diabetes, needs carbohydrate. Carbohydrate foods include bread, cereal, pasta, rice, fruit, dairy products and vegetables (especially starchy vegetables).

When we eat these foods, the body breaks them down into glucose. The glucose moves around the body in the-bloodstream. Some of the glucose is taken to our-brain to help us think clearly and function. The remainder of the glucose is taken to the cells of our body for energy and also to our liver, where it is stored as energy that is used later by the body. In order for the body to use glucose for energy, insulin-is required. Insulin is a hormone that is produced by the beta cells in the pancreas. Insulin works like a key to a door. Insulin attaches itself to doors on the cell, opening the door to allow glucose to move from the blood stream,

through the door, and into the cell.If the pancreas is not able to produce enough insulin(insulin deficiency) or if the body cannot use the insulin it produces (insulin resistance), glucose builds up in the bloodstream (hyperglycaemia) and diabetes develops. Diabetes Mellitus means high levels of sugar (glucose) in the blood stream and in the urine.

✧ ***Types of Diabetes:***

◆ *Type 1:*

Diabetes means that the immune system Is compromised and the cells fail to produce insulin insufficient amounts. There are no eloquent studies that prove the causes of type 1 diabetes and there are currently no known methods of prevention.

◆ *Type 2:*

Diabetes means that the cells produce a low quantity of insulin or the body can't use the insulin correctly. This is the most common type of diabetes,thus affecting 90% of persons diagnosed with diabetes. It is caused by both genetic factors and the manner of living. Gestational diabetes appears in pregnant women who suddenly develop high blood sugar. In two thirds of the cases, it will reappear during subsequent pregnancies. There is a great chance that type 1 or type 2 diabetes will occur after a pregnancy affected by gestational diabetes.

✧ **Symptoms of Diabetes:**

- Frequent Urination
- Increased thirst
- Tired/Sleepiness
- Weight loss
- Blurred vision

- Mood swings
- Confusion and difficulty concentrating
- frequent infections

✧ *Causes of Diabetes:*

Genetic factors are the main cause of diabetes. It is caused by at least two mutant genes in the chromosome 6, the chromosome that affects the response of the body to various antigens.Viral infection may also influence the occurrence of type 1 and type 2 diabetes. Studies have shown i n infection with viruses such as rubella, Cytomegalovirus,mumps, hepatitis B virus, and megalomaniac virus increase the risk of developing diabetes.

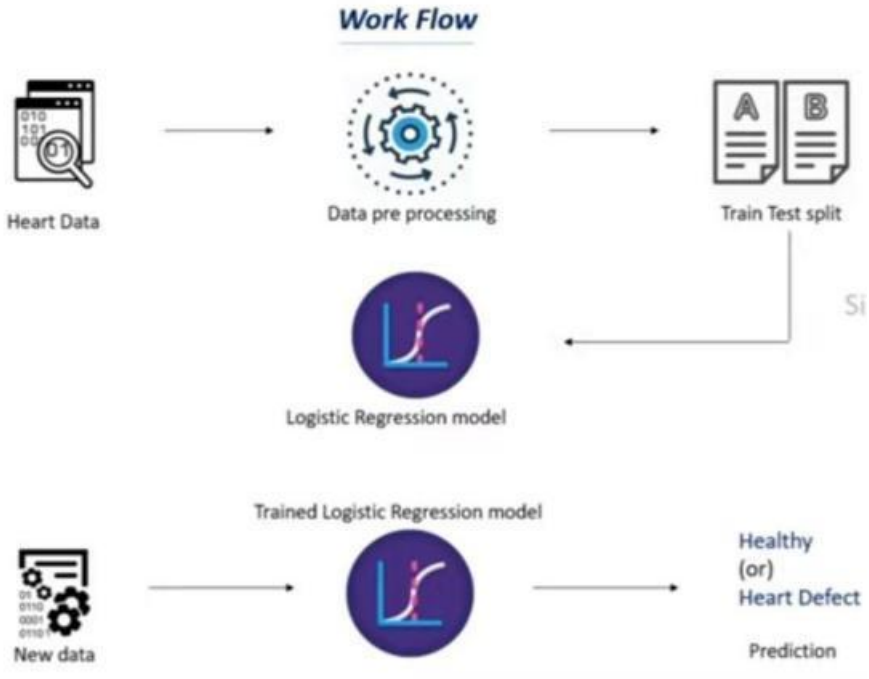
10.1.1.1 RELATED WORKS :

Diabetes prediction is a classification technique with two mutually exclusive possible outcomes, either the person is diabetic or not diabetic. After extensive research,We came to conclusion that although numerous classification techniques can be used for the purpose of prediction, the observed accuracy varied.

The primary factor which influenced our algorithm selection was its adaptability and compatibility with future applications. The inevitable shift of data storage toward DNA makes neural networks the apparent choice. Neural networks use neurons to transmit data across various layers, with each node working on a different weighted parameter to help predict diabetes.The point of this framework is to make an ML model, which can anticipate with precision the likelihood or the odds of a patient

being diabetic. The ordinary distinguishing process for the location of diabetes is that the patient needs to visit asymptomatic focus. One of the key issues of bio-informatics examination is to achieve precise outcomes from the information.Human mistakes or various laboratory test scan entangle the procedure of identification of the disease. This model can foresee whether the patient has diabetes or not, aiding specialists to ensure that the patient in need of clinical consideration can get it on schedule and also help anticipate the loss of human lives

10.2 HEART DISEASE PREDICTION MODULE :



It is well known fact that patients when affected with heart disease are subjected to lot of tests like ECG, EKG, and so on. But these tests are carried out only when the person gets chest pain or kind of symptom leading to heart disease. In today's world there are lot of body wearable devices which could give the pulse rate, Blood pressure and so. There is

nothing like person would get heart disease only after the age of 40. The current generation is under lot of stress. So, there is an urgent need to perform data analysis of the physiological parameter towards possibility of heart disease before attack happens. So, towards this some amount of research carried out by employing Machine learning algorithm for prediction of heart disease like Regression, KNN, SVM, Bayes, Decision Tree and so on. So, with the upcoming Deep learning, we here have proposed to develop a heart disease prediction system with highest accuracy as compared to other machine learning algorithm based on thirteen physiological parameters as compared to most important ones which are heart rate, age and sex alone.

10.2.1 HEART DISEASE DESCRIPTION :

In our day to day life, there are many factors that affect the human heart. The report by World Health Statistics puts emphasis on this fact: one out of three adults all over the world today, is suffering from hypertension, i.e., elevated levels of blood pressure – a condition which results in deaths from a stroke or leads to heart attacks and other heart related diseases. Heart diseases, also called by the name cardiovascular diseases, include a no. of factors that can affect the heart – which not only include the heart attacks. Cardiovascular diseases can be considered a primary reason of casualty in numerous countries. Cardiovascular diseases result in the death of one person in an average of 34 seconds as stated by a study held in USA. Coronary Cardiovascular disease, Heart disease and Cardiomyopathy, all fall under the categories of heart/ cardiovascular diseases. The term Cardio Vascular Disease consists of various conditions that affects heart, blood vessels, and the way in which the pumping and circulation of blood takes place all through the body. Diagnosis is quite a complex as well as a necessary task that needs to be

carried out efficiently as well as accurately. Mostly, the diagnosis/detection is made and based over the doctor's knowledge, skill and professional experience. This provides many undesirable outcomes and over the budget medical cost for the treatments given to the patients. Hence, it is extremely beneficial to have a system for automating the medical diagnosis for predicting the possibility of heart disease before it happens based on certain physiological parameters.

10.2.2 CAUSES OF HEART DISEASE :

The reasons of a particular form of heart disease vary. Heart disease comes in a variety of forms.The following are some conditions or common causes of arrhythmia Cardiomyopathy, Coronary artery disease, Diabetes, Drug misuse, Emotional stress, Excessive use of alcohol or caffeine, Heart problems present at birth (congenital heart defects) High blood pressure We have mixed structured and unstructured data in the health care fields to determine disease risk in this project. The use of a latent factor model to recreate missing data in medical records obtained from online sources. We could also assess the major chronic diseases in a specific area and population using statistical information. We consult hospital experts to learn about useful features when dealing with structured data. We apply the random forest technique to automatically identify characteristics from unstructured text files

10.2.3 CHALLENGES :

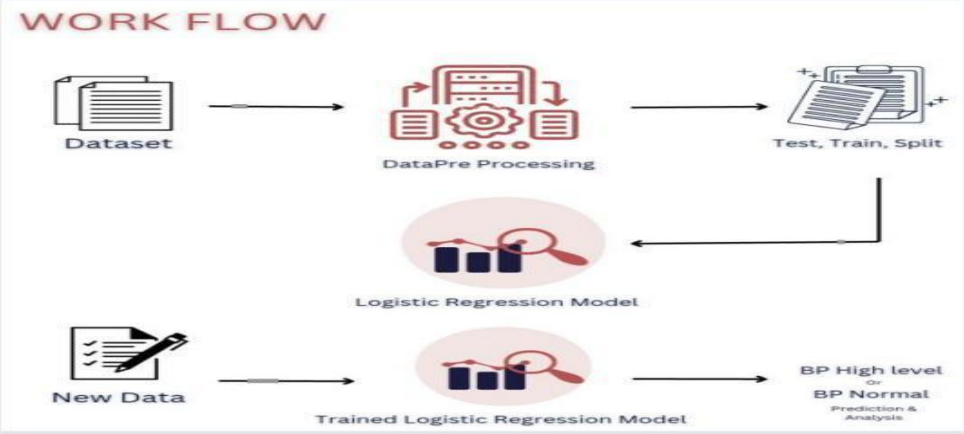
The major challenge in heart disease is its detection. There are instruments available which can predict heart disease but either they are expensive or are not efficient to calculate chance of heart disease in human. Early detection of cardiac diseases can decrease the mortality rate

and overall complications. However, it is not possible to monitor patients every day in all cases accurately and consultation of a patient for 24 hours by a doctor is not available since it requires more sapience,time and expertise. Since we have a good amount of data in today's world, we can use various machine learning algorithms to analyze the data for hidden patterns. The hidden patterns can be used for health diagnosis in medicinal data.

12.2.4 RELATED WORKS :

Many researches have been conducted in attempt to pinpoint the most influential factors of heart disease as well as accurately predict the overall risk. Heart Disease is even highlighted as a silent killer which leads to the death of the person without obvious symptoms.The early diagnosis of heart disease plays a vital role in making decisions on lifestyle changes in high-risk patients and in turn reduce the complications. This project aims to predict future Heart Disease by analyzing data of patients which classifies whether they have heart disease or not using machine learning algorithms.

10.3 BLOOD PRESSURE PREDICTION MODULE :



Hypertension and its related complications are the important contributing factors for major adverse cardiovascular events all over the world. India reveals that both its incidence and prevalence are increasing even in young population both in urban and rural areas. In order to predict, various age range in people population has been taken. In any system proposed or generalized or on the basis of two important intrinsic components :

A. Systolic Blood Pressure

B. Diastolic Blood Pressure

Systolic blood pressure measures the pressure in your arteries when your heart beats, this pressure is caused when the heart muscle is contracting and pumps oxygenated blood out into the arteries. Diastolic blood pressure measures the pressure in your arteries when heart rests between beats, Therefore, it is observed that the diastolic pressure is always lower as compared to the systolic pressure. In any system proposed or generalized where input is entered in the form of 2 values as M and N. M- Systolic Blood Pressure N- Diastolic Blood Pressure The system runs a comparative analysis of M value with standard blood pressure value of 120 and N value with standard pressure of exertion while heart beat resting of 80.If the value of inputs are less than 120/80, then it is detected as Low blood pressure. If the value of inputs are more than 120/80, then it is detected as high blood pressure/hypertension. Further categorized as Stage 1(130-139/80-89 mm Hg) and Stage 2(140/90 and higher mm Hg) . That said, the above blood pressure requires sophisticated hardware and are calculated in Mercury based sphygmomanometer, Aneroid sphygmomanometer and Automatic digital sphygmomanometer, which may not be affordable or available only in hospitals and medical centers. Thus BP module of prediction focused on the other factors which can be responsible for elevation of blood pressure,

Mostly, the diagnosis/detection is made and based over the doctor's knowledge, skill and professional experience for the maximum accuracy of the results. This provides many undesirable outcomes and over the budget medical cost for the treatments given to the patients. Hence, it is highly optimistic to have a system for automating the medical diagnosis for predicting the possibility of blood pressure based on certain physiological parameters, which are further listed in detail in the Description section.

10.3.1 BLOOD PRESSURE DESCRIPTION :

Overall prevalence for hypertension in India was 29.8% (95% confidence interval: 26.7–33.0). Significant differences in hypertension prevalence were noted between rural and urban parts [27.6% (23.2–32.0) and 33.8% (29.7–37.8); P = 0.05]. Urban population exposed to the new technological advancements has reduced the physical competence of human body. Which took a whole stroll, where proper amount of balance in food, exercise ..etc furthermore the generation of future gets affected by blood pressure through genetics and inheritance. Thus description of how each extrinsic factors such as:

A. Level of Haemoglobin
B. Age
C. Body Mass Index (BMI)
D. Gender
E. Smoking
F. Physical Activity
G. Salt Content in diet
H. Levels of Stress

10.3.2 CHALLENGES :

Although there are many predictive systems for epidemic diseases and disorders such as diabetes, heart disease…etc which can provide a subsequent detail value and accuracy models for the future prediction. In case of blood pressure requires sophisticated machines, time, which rather much not considered to be an alarming factor for identification. Various implementations are present, though they fail provide the results of accuracy. Blood pressure may be caused by various other factors excluding the ones taking in the data leading to poor estimation for prediction and diagnosis.

10.3.3 RELATED WORKS :

Blood pressure diseases have increasingly been identified as among the main factors threatening human health. How to accurately and conveniently measure blood pressure is the key to the implementation of effective prevention and control measures for blood pressure diseases. Traditional blood pressure measurement methods exhibit many inherent disadvantages, for example, the time needed for each measurement is difficult to determine, continuous measurement causes discomfort, and the measurement process is relatively cumbersome. Wearable devices that enable continuous measurement of blood pressure provide new opportunities and hopes. Although machine learning methods for blood pressure prediction have been studied, the accuracy of the results does not satisfy the needs of practical applications.

11. SYSTEM TESTING

11.1 UNIT TESTING :

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application. It is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

13.2 INTEGRATION TESTING :

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

11.3 FUNCTIONAL TESTING :

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

11.3.1 FUNCTIONAL TESTING IS CENTERED ON THE FOLLOWING ITEMS ::

- Valid Input : identified classes of valid input must be accepted.
- Invalid Input : identified classes of invalid input must be rejected.
- Functions : identified functions must be exercised.
- Output : identified classes of application outputs must be exercised.
- Systems/Procedures: interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

11.4 WHITE BOX TESTING :

White Box Testing is a testing in which in which the software tester has knowledge of the inner workings, structure and language of the software, or at least its purpose. It is purpose. It is used to test areas that cannot be reached from a black box level.

11.5 BLACK BOX TESTING :

Black Box Testing is testing the software without any knowledge of the inner workings, structure or language of the module being tested. Black box tests, as most other kinds of tests, must be written from a definitive source document, such as specification or requirements document, such as specification or requirements document. It is a testing in which the software under test is treated, as a black box .One cannot "see" into it. The test provides inputs and responds to outputs without considering how the software works.

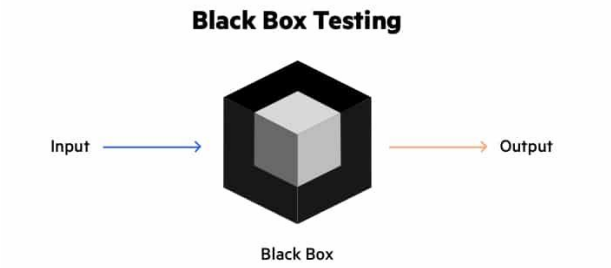


Figure 11.5 Black Box Testing

12. SYSTEM IMPLEMENTATION

The next step in analysis is to verify the feasibility of the proposed system. “All projects are feasible given unlimited resources and infinite time“. But in reality both resources and time are scarce. Project should confirm to time bounce and should be optimal in there consumption of resources. These places a constant are approval of any project.

Feasibility has applied to our project pertains to the following areas:

1. Technical feasibility
2. Operational feasibility
3. Economical feasibility

12.1 TECHNICAL FEASIBILITY:

To determine whether the proposed system is technically feasible, we should take into consideration the technical issues involved behind the system. Our prediction and diagnosis system uses the machine learning algorithms, which is rampantly employed these days worldwide. The world without the web is incomprehensible today. That goes to proposed system is technically feasible.

12.2 OPERATIONAL FEASIBILITY:

To determine the operational feasibility of the system we should take into consideration the awareness level of the users. This system is operational feasible since the users are familiar with the technologies and hence there is no need to gear up the personnel to use system. Also the system is very friendly and to use.

12.3 ECONOMIC FEASIBILITY:

To decide whether a project is economically feasible, we have to consider various factors as:

1.Cost benefit analysis

2. Long-term returns

3. Maintenance costs

The proposed prediction and diagnosis system is computer based. It requires average computing capabilities and access to internet, which are very basic requirements and can be afforded by any organization and the peoples, hence it doesn't occur additional economic overheads, which renders the system economically feasible

14. CONCLUSION

Diabetes, blood pressure, and heart disease are widespread chronic diseases that affect millions of people worldwide. Early detection and management of these diseases are crucial to prevent complications and improve outcomes. Thus diabetes, blood pressure, and heart disease prediction and diagnosis using web application shown promise in further prediction and diagnosing of various other diseases for people without acknowledgement of gender, ethinicity and free of cost across the world. This project successfully implemented which can further take it to a higher level of producing more features and easy guidance of every step for the users.

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APPENDICES

APPENDIX 1 - CODING

```
import pickle
import streamlit as st
from streamlit_option_menu import option_menu

# loading the saved models

diabetes_mode=pickle.load(open("C:/Users/giris/OneDrive/Desktop/mult
iple disease prediction system/saved models/diabetes_model .sav", "rb"))

heart_disease_model                                                    =
pickle.load(open("C:/Users/giris/OneDrive/Desktop/multiple        disease
prediction system/saved models/heart_disease_model (1).sav","rb"))

bp_disease_model                                                       =
pickle.load(open("C:/Users/giris/OneDrive/Desktop/multiple        disease
prediction system/saved models/bp_model (1).sav","rb"))

# sidebar for navigation
with st.sidebar:
    selected = option_menu('Prediction System',

                           ['Diabetes Prediction',
                            'Blood Pressure Prediction',
                            'Heart Disease Prediction' ],
                           icons=['activity','person','heart',],
                           default_index=0)

# Diabetes Prediction Page
if (selected == 'Diabetes Prediction'):
    # page title
    st.title('DIABETES')
```

```
st.markdown('## PREDICTION SYSTEM')


# getting the input data from the user
col1, col2, col3 = st.columns(3)

with col1:
    Pregnancies = st.text_input('Number of Pregnancies')

with col2:
    Glucose = st.text_input('Glucose Level')

with col3:
    BloodPressure = st.text_input('Blood Pressure value')

with col1:
    SkinThickness = st.text_input('Skin Thickness value')

with col2:
    Insulin = st.text_input('Insulin Level')

with col3:
    BMI = st.text_input('BMI value')

with col1:
    DiabetesPedigreeFunction = st.text_input('Diabetes Pedigree
Function value')

with col2:
    Age = st.text_input('Age of the Person')

# code for Prediction
diab_diagnosis = ''
# creating a button for Prediction
if st.button('Diabetes Test Result'):
```

```
        diab_prediction = diabetes_model.predict([[Pregnancies, Glucose, BloodPressure, SkinThickness, Insulin, BMI, DiabetesPedigreeFunction, Age]])

        if (diab_prediction[0] == 1):
          diab_diagnosis = """The person is diabetic.

          Kindly click the link to view diagnosis system """
        else:
          diab_diagnosis = 'The person is not diabetic'

    st.success(diab_diagnosis)

# Blood Pressure Prediction Page
if (selected == 'Blood Pressure Prediction'):

    # page title
    st.title('BLOOOD PRESSURE')
    st.markdown('## PREDICTION SYSTEM')

    # getting the input data from the user
    col1, col2, col3 = st.columns(3)

    with col1:
        Level_of_Hemoglobin = st.text_input("Level of Hemoglobin")

    with col2:
        Age = st.text_input("Age")

    with col3:
       BMI = st.text_input("BMI value")

    with col1:
        Sex = st.text_input("Sex")

    with col2:
        Smoking = st.text_input("Smoking")
```

```
    with col3:
      Physical_activity= st.text_input("Physical activity")

    with col1:
       salt_content_in_the_diet = st.text_input("salt content in the diet")

    with col2:
       Level_of_Stress = st.text_input("Level of Stress")

    with col3:
       Chronic_kidney_disease = st.text_input("Chronic_kidney_disease")

    with col1:
       Adrenal_and_thyroid_disorders                                    =
st.text_input("Adrenal_and_thyroid_disorders")

    # code for Prediction
    bp_diagnosis = ''

    # creating a button for Prediction

    if st.button('bp Test Result'):
       bp_prediction                                                    =
bp_disease_model.predict([[float(Level_of_Hemoglobin),int(Age),int(B
MI),int(Sex),int(Smoking),int(Physical_activity),int(salt_content_in_the_
diet),int(Level_of_Stress),int(Chronic_kidney_disease),int(Adrenal_and_
thyroid_disorders)]])

       if (bp_prediction[0] == 1):
         bp_diagnosis = """The person is not bp patient.

         Kindly check the diagnosis system"""

       else:
         bp_diagnosis = 'The person is bp patient'
```

```
    st.success(bp_diagnosis)

# Heart Disease Prediction Page
if (selected == 'Heart Disease Prediction'):

    # page title
    st.title('HEART DISEASE')
    st.markdown('## PREDICTION SYSTEM')

    col1, col2, col3 = st.columns(3)

    with col1:
        age = st.text_input('Age')

    with col2:
        sex = st.text_input('Sex')

    with col3:
        cp = st.text_input('Chest Pain types')

    with col1:
        trestbps = st.text_input('Resting Blood Pressure')

    with col2:
        chol = st.text_input('Serum Cholestoral in mg/dl')

    with col3:
        fbs = st.text_input('Fasting Blood Sugar > 120 mg/dl')

    with col1:
        restecg = st.text_input('Resting Electrocardiographic results')

    with col2:
        thalach = st.text_input('Maximum Heart Rate achieved')

    with col3:
        exang = st.text_input('Exercise Induced Angina')
```

```
    with col1:
        oldpeak = st.text_input('ST depression induced by exercise')

    with col2:
        slope = st.text_input('Slope of the peak exercise ST segment')

    with col3:
        ca = st.text_input('Major vessels colored by flourosopy')

    with col1:
        thal = st.text_input('thal:')

    # code for Prediction
    heart_diagnosis = ''

    # creating a button for Prediction

    if st.button('Heart Disease Test Result'):
        heart_prediction                                                    =
heart_disease_model.predict([[int(age),int(sex),int(cp),int(trestbps),int(ch
ol),int(fbs),int(restecg),int(thalach),int(exang),float(oldpeak),int(slope),int
(ca),int(thal)]])

        if (heart_prediction[0] == 1):
          heart_diagnosis = """The person is having heart disease.

          Kindly check the diagnosis system"""
        else:
          heart_diagnosis = 'The person does not have any heart disease'

    st.success(heart_diagnosis)

#Diagonisis system
with st.sidebar:
    selected = option_menu('Diagnosis System'
                           ['Diabetes Diagnosis',
```

```
                    'Blood Pressure Diagnosis',
                    'Heart Disease Diagnosis' ],
                   icons=['activity','person','heart'],
                   default_index=0)

# Diabetes Diagnosis Page
if(selected == 'Diabetes Diagnosis'):
   st.title('DIAGNOSIS SYSTEM')
   st.write(""" lOW SUGAR LEVELS

       Before fasting : less than 60mg/dl
       After fasting : less than 70mg/dl.

         """)
   st.write(""" HIGH SUGAR LEVELS :

         Before fasting : Greater  than 100mg/dl
         After fasting : Greater than 140mg/dl.

          """)
   if st.checkbox("Allopathic Remedies"):
      if st.checkbox("low Sugar"):
         st.write(""" Prescribed Medicines:

               Diazoxide , Octreotide , Dextrose ,Glucagon .
              """)
      elif st.checkbox("High sugar"):
        st.write(""" Prescribed Medicines:

             DPP-4  inhibitors  ,  Sulfonylureas  ,  Metformin  ,SGLT2
inhibitors
             """)

   elif st.checkbox("Homeopathy Remedies"):
       if st.checkbox("low Sugar"):
          st.write(""" Prescribed Medicines:
```

```
                Nux vomica , Oenothera biennis , Arsenicum  .
                """)
        elif st.checkbox("High sugar"):
          st.write(""" Prescribed Medicines:

                Abroma Augusta , Syzygium Jambolanum , Phosphoric acid , Phosphorus .

                """)
    elif st.checkbox("Ayurvedic remedies"):
       if st.checkbox("low Sugar"):
          st.write(""" Prescribed Medicines:

                Amla , Cinnamon ,Fenugreek , Bitter Gourd  .

                """)
       elif st.checkbox("High sugar"):
         st.write(""" Prescribed Medicines:

                Turmeric , Gymnema Sylvestre ,Holy Basil (Tulsi) , Ginger .

                """)
    else:
       Pass

 # Blood Pressure Diagnosis Page
if(selected == 'Blood Pressure Diagnosis'):
    st.title('DIAGNOSIS SYSTEM')
    st.write(""" lOW BP LEVELS

        Systolic Blood pressure :less than 120 mmGh
        Diasystolic Blood pressure :less than 80mGh

            """)
    st.write(""" HIGH BP LEVELS :

            Systolic Blood pressure :greater than 129 mmGh
```

```
            Diasystolic Blood pressure :greater than 89 mmGh

            """)
    if st.checkbox("Allopathic Remedies"):

        pass
#Heart Disease Diagnosis Page
if(selected == 'Heart Disease Diagnosis'):
    st.title('DIAGNOSIS SYSTEM')
    if st.checkbox("Allopathic Remedies"):
     st.write(""" Prescribed Medicines:

            Statins , Beta -Blockers , Aspirin ,Clopidogrel , Warfarin ,ACE Inhibitors.

            """)
    elif st.checkbox("Homeopathy Remedies"):
        st.write(""" Prescribed Medicines:

              Latrodectus,Aurum metallium,Aconitum Catus ,Digitalis,Glononium

              """)
    elif st.checkbox("Ayurvedic remedies"):
        st.write(""" Prescribed Medicines:

             Triphila,Ashwagandha ,Noni capsules,Nerve Up tablet,Hrudroga Chintamani Rasa

              """)
    else:
        pass

st.markdown(""" # GENERAL PRECAUTIONS

        ### Have 8 hrs of sleep.  Make sure that you have your meal on time.  Regularly do exercise.  """)
```

APPENDIX II - SCREEN SHOTS

DIABETES MODULE

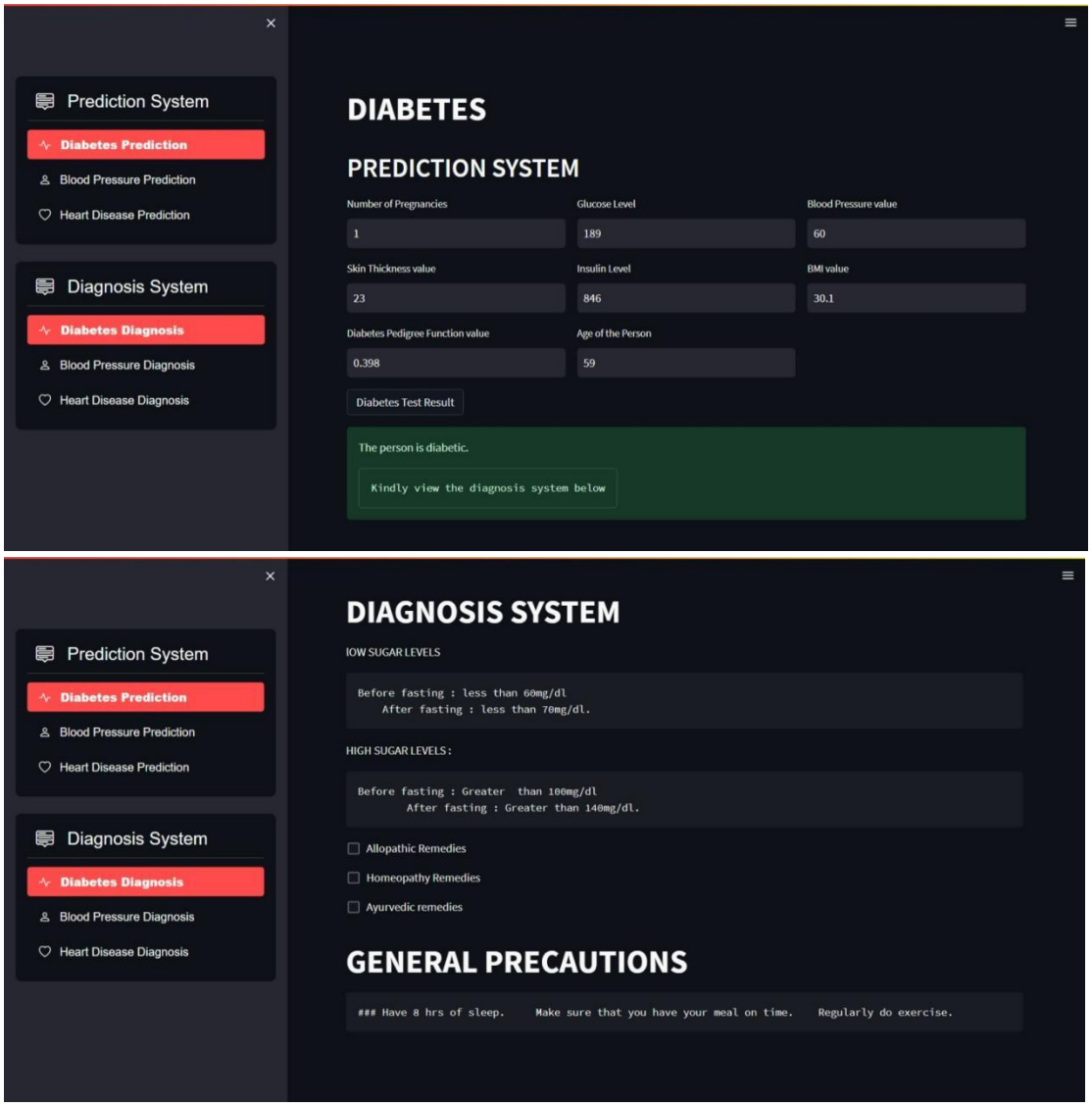

Figure 15.1 Output Screen

BLOOD PRESURE MODULE

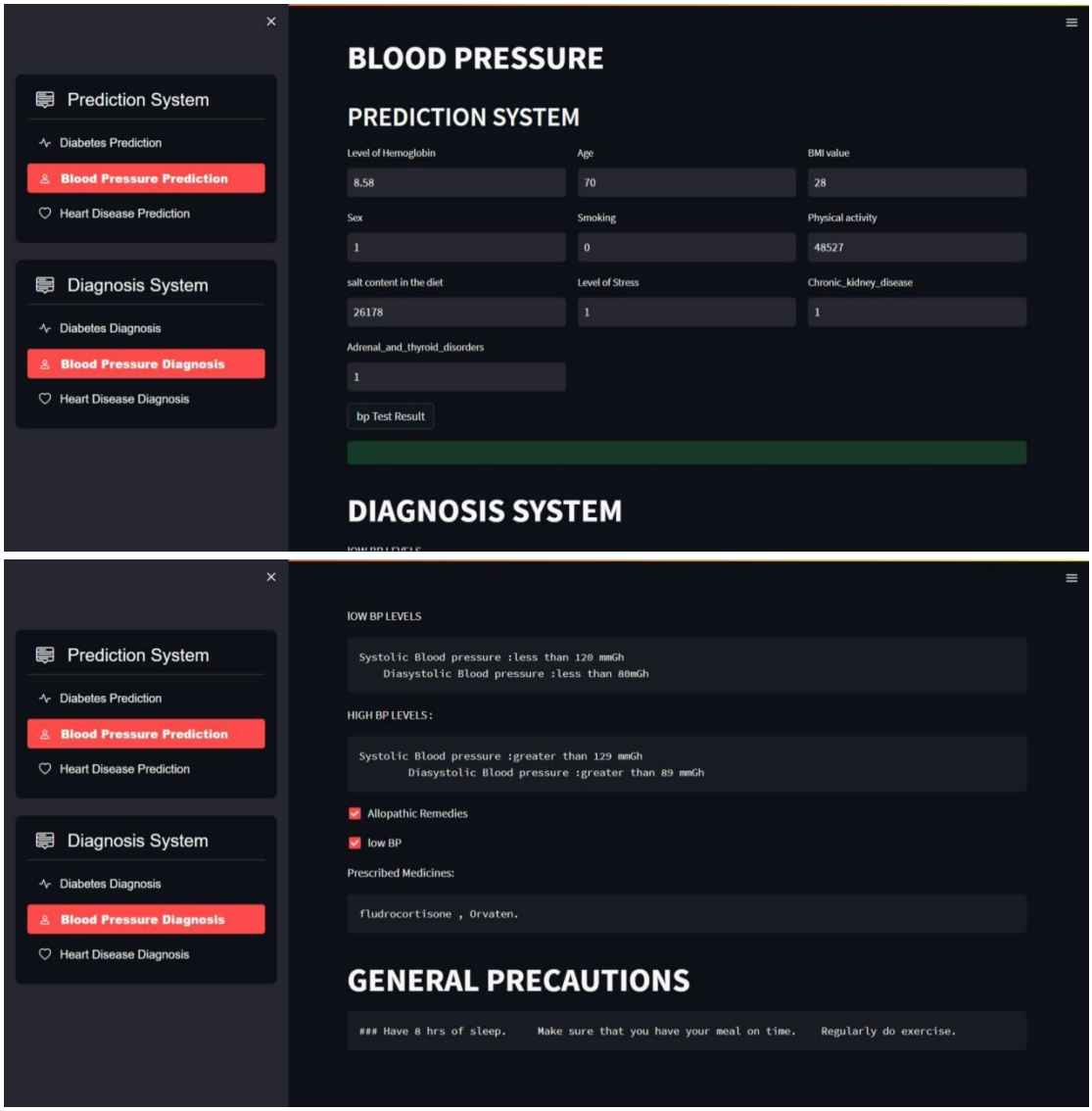

Figure 15.2 Output Screen

HEART DISEASE MODULE

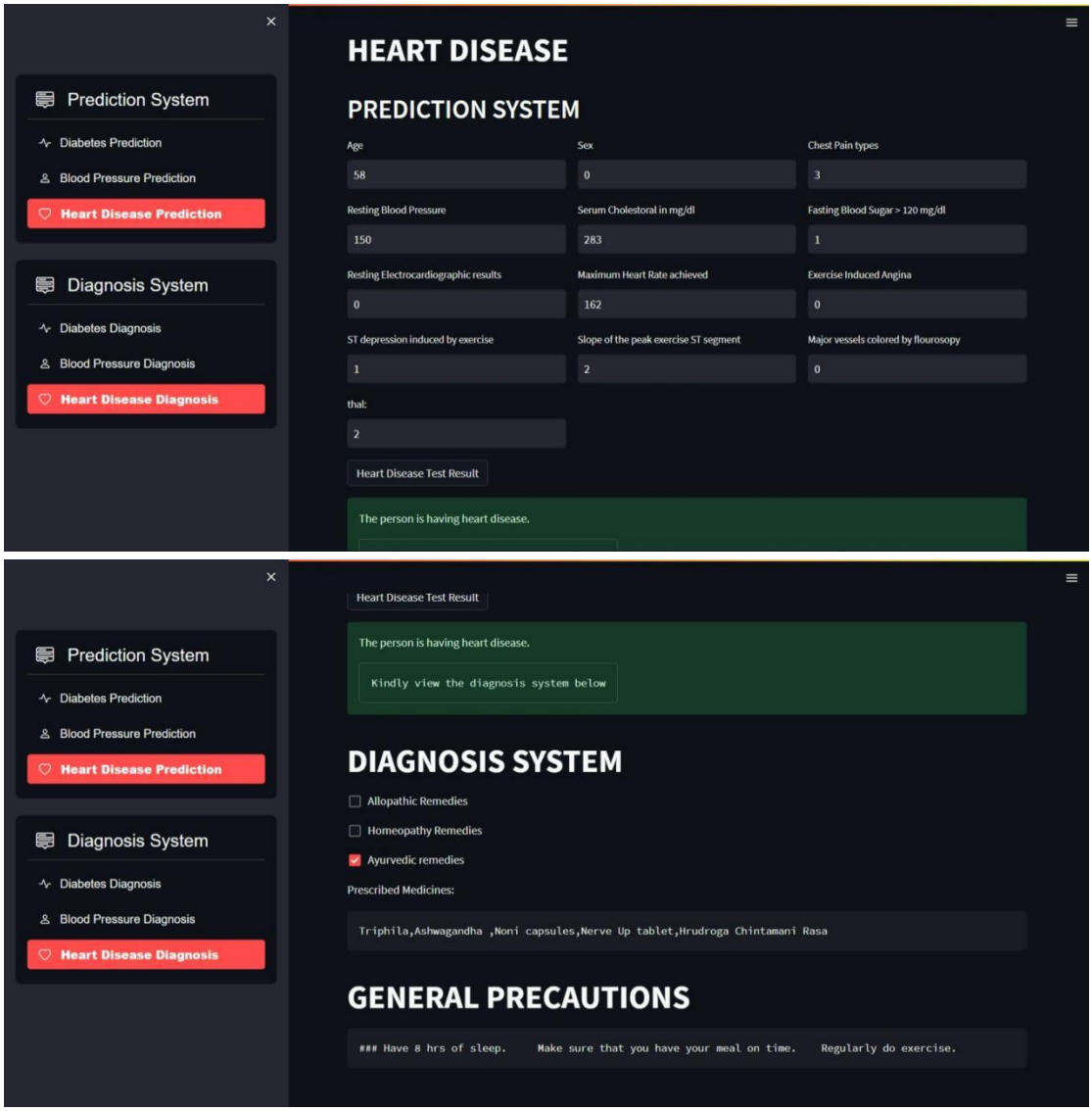

Figure 15.3 Output Screen

CERTIFICATE OF PUBLICATION

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This is to certify that SHRUTHI R of

Jeppiaar Engineering College

has actively participated and presented a research paper in **ICONSTEM 2023** titled

"DIABETES,BLOOD PRESSURE AND HEART DISEASE PREDICTION USING WEB APPLICATION"

in the 8th IEEE Sponsored International Conference on Science, Technology, Engineering and Mathematics (ICONSTEM 2023) organized by Jeppiaar Engineering College on 6th & 7th April, 2023.

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